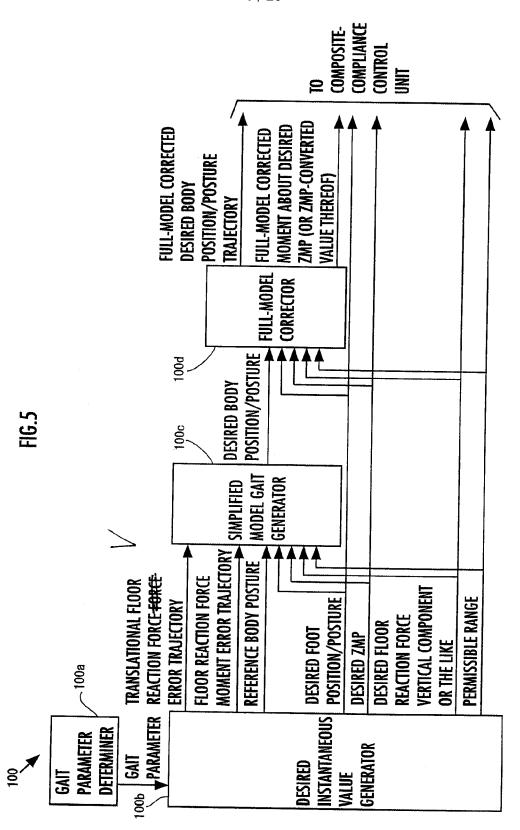
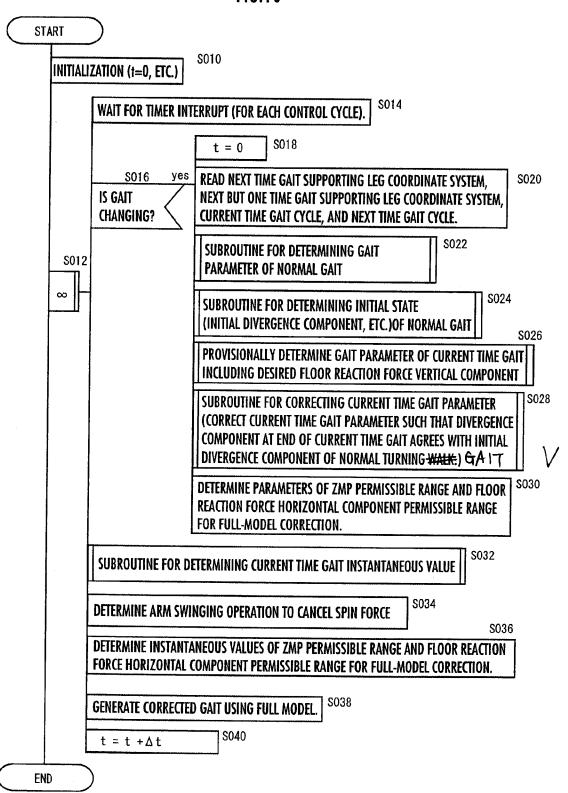
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FIG.10



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ENTRY

FIG.12

DETERMINE INITIAL STATES (STATES AT INITIAL TIME Ts) OF FOOT POSITION/POSTURE, BODY S200 POSTURE ANGLE $\, heta$ bs, and arm postures on the basis of normal turning gait parameter. PROVISIONALLY DETERMINE INITIAL (AT Ts) BODY HORIZONTAL POSITION, VELOCITY, \$202 ANGULAR VELOCITY, AND BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE PEAK VALUE CANDIDATES (Xs, Vxs, wbs, ZMPrecheck). DETERMINE INITIAL BODY VERTICAL POSITION/VELOCITY (Zs, Vzs). \$206 USING DYNAMIC MODEL, GENERATE GAIT FOR ONE STEP ON THE BASIS OF NORMAL S208 TURNING GAIT PARAMETER INCLUDING ZMPrecpeek, TAKING θ bs, (Xs, Vxs, ω bs), Peak (Zs,Vzs) AS INITIAL STATES OF BODY. HORIZONTAL \$210 CONVERT TERMINAL BODY POSITION, VELOCITY, POSTURE ANGLE, AND ANGULAR VELOCITY OF GENERATED GAIT INTO VALUES OBSERVED FROM SUPPORTING LEG COORDINATE SYSTEM OF NEXT STEP, AND DENOTE THE VALUES BY (Xe, Vxe, θ be, ω be). \$212 BOUNDARY CONDITION ERRORS (errx, errv, err θ , err ω) \$204 = (Xs, Vxs, θ bs, ω bs)-(Xe, Vxe, θ be, ω be) ∞ LEAVE REPETITION LOOP. ARE ALL errx, errv, err θ b, AND err ω b WITHIN PERMISSIBLE RANGES? Peek > Peak DETERMINE A PLURALITY OF CANDIDATES (Xs+ \triangle Xs, Vxs, ω bs, ZMPreceek), S216 (Xs, Vxs+ \triangle Vxs, ω bs, ZMPreceek), (Xs, Vxs, ω bs+ \triangle ω bs, ZMPreceek). (Xs, Vxs, ω bs, ZMPreceek+ \triangle ZMPreceek) IN THE VICINITY OF (Xs, Vxs, ω bs, ZMPreceek), AND BASED ON THEM, DETERMINE BOUNDARY CONDITION ERROR CORRESPONDING TO EACH OF THEM AS DESCRIBED ABOVE. DETERMINE NEW CANDIDATES (Xs, Vxs, ω bs, ZMPreceek) ON THE BASIS OF BOUNDARY S218 CONDITION ERRORS CORRESPONDING TO (Xs, Vxs, ω bs, ZMPrecpeek) AND EACH OF CANDIDATES IN THE VICINITY THEREOF. PeaK HOKIZONTAL DETERMINE INITIAL BODY POSITION, VELOCITY, POSTURE ANGLE, AND ANGULAR VELOCITY \$220 (X0, Vx0, $\,artheta$ b0, $\,\omega$ b0), initial body vertical position and velocity (z0, Vz0), and initial body POSTURE ANGLE AND ANGULAR VELOCITY AT ORIGINAL INITIAL TIME O. DETERMINE NORMAL TURNING INITIAL DIVERGENCE COMPONENT q[0] S222 ACCORDING TO THE FOLLOWING EXPRESSION. $q[0] = X0 + Vx0 / \omega 0$ DETERMINE q", WHICH IS THE VALUE OF NORMAL TURNING INITIAL DIVERGENCE COMPONENT q[0] S224 OBSERVED FROM SUPPORTING LEG COORDINATE SYSTEM OF CURRENT TIME GAIT, AND (ZO", VzO"), WHICH ARE VALUES OF INITIAL BODY VERTICAL POSITION AND VELOCITY OBSERVED FROM SUPPORTING LEG COORDINATE SYSTEM OF CURRENT TIME GAIT.

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FIG.17

S028 **ENTRY** S700 PROVISIONALLY DETERMINE ZMP CORRECTION PARAMETER CANDIDATE a AND BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE PEAK VALUE CANDIDATES (ZMPrecpeeks). Peaka Peakb S704 CALCULATE PROVISIONAL CURRENT TIME GAIT UNTIL TERMINATING TIME ON THE BASIS OF PARAMETER OBTAINED BY CORRECTING ZMP PARAMETER, WHICH HAS BEEN PROVISIONALLY DETERMINED BY PROVISIONAL DETERMINATION PROCESSING OF CURRENT TIME GAIT PARAMETER, BY ZMP CORRECTION PARAMETER CANDIDATE a, BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE PEAK VALUE CANDIDATES (ZMPrecpooka, ZMPrecpookb), AND OTHER CURRENT TIME GAIT PARAMETERS. Peuka Peak b DETERMINE TERMINAL DIVERGENCE COMPONENT QO[k] ACCORDING TO THE FOLLOWING EXPRESSION FROM BODY POSITION/VELOCITY (Xe, Ve) AT TERMINATING END OF CURRENT TIME GAIT: $a0[k] = Xe + Vxe / \omega 0$ S708 DETERMINE TERMINAL DIVERGENCE COMPONENT ERROR erro ACCORDING TO THE FOLLOWING EXPRESSION: errq = q0[k] - q''\$710 TERMINAL BODY POSTURE ANGLE ERROR θ berr = NORMAL GAIT INITIAL BODY POSTURE ANGLE CURRENT TIME GAIT TERMINAL BODY POSTURE ANGLE TERMINAL BODY POSTURE ANGULAR VELOCITY ERROR ω berr = NORMAL GAIT INITIAL BODY POSTURE ANGULAR VELOCITY - CURRENT TIME GAIT TERMINAL BODY POSTURE ANGULAR VELOCITY \$712 yes \$702 LEAVE REPETITION LOOP. ARE ALL errq, θ berr, AND ω berr peeka-peaka, peekb-peakb WITHIN PERMISSIBLE RANGES? 00 DETERMINE A PLURALITY OF CANDIDATES ($a+ \triangle a$, ZMPrecpeeka, ZMPrecpeekb), (a, ZMPrecpoeka+ △ ZMPrecpoeka, ZMPrecpoekb), AND (a, ZMPrecpeeka, ZMPrecpeekb+ △ ZMPrecpeekb) IN THE VICINITY OF (a, ZMPrecpeeka, ZMPrecpeekb), AND BASED ON THEM, DETERMINE ERROR CORRESPONDING TO EACH OF THEM AS DESCRIBED ABOVE. DETERMINE NEW PARAMETER CANDIDATES (a, ZMPrespooka, ZMPrecpookb) ON THE BASIS OF S716 (a, ZMPrecpooka, ZMPrecpookb) AND ERROR CORRESPONDING TO EACH OF CANDIDATES IN THE VICINITY THEREOF.

RETURN

FIG. 19
BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE OF NORMAL GAIT (ZMPrec)

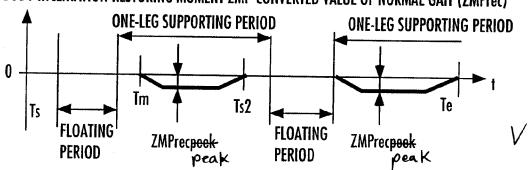


FIG.20

BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE OF CURRENT TIME GAIT (ZMPrec)

